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Finding the right spot: laws governing the siting of aquaculture activities

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Marine aquaculture has grown enormously in recent decades, and with it the competition for space suitable for aquaculture. These developments have limited the areas available for aquaculture and, in some cases, have become a barrier to expansion. In response, aquaculture operations have moved further away from the coast. This development has created a need for clearer and more robust approaches to more comprehensively describe and secure sites for aquaculture. This article reviews the law governing the siting of aquaculture operations. In particular, it assesses the role of the widely used term “offshore” in the Law of the Sea to see if there are any legal aspects that need to be considered in moving towards the use of more specific concepts. It also aims to inform scientific discussions and political and administrative processes on the law governing the identification, description, and siting of aquaculture operations. This will hopefully contribute to more sustainable and less conflicted long-term aquaculture development.

KEYWORDS

aquaculture law, aquaculture governance, marine spatial planning, siting of aquaculture operations, sustainable aquaculture

1 Introduction

The farming of fish, crustaceans, molluscs and various marine plants has grown rapidly in recent decades. According to the FAO, in 2022 and for the first time in history, aquaculture has surpassed capture fisheries as the main producer of aquatic animals (FAO, 2024a). As a result, aquaculture is already making a significant contribution to meeting the global demand for fish in the face of a growing population, changing consumption patterns among the expanding middle classes in developing countries, and mitigating the depletion of many wild fish stocks (see also FAO, 2022, pp. 211–216). Farmed seafood also performs well in terms of sustainability compared to other livestock production worldwide (Troell et al., 2023; Naylor et al., 2021).

Its dramatic expansion, however, has also raised a number of concerns and objections, particularly regarding negative environmental impacts and its overall level of sustainability (Jiang et al., 2022; Wilding et al., 2018; Weitzman et al., 2019; GESAMP, 1991, 2008), and

lately also with neglecting animal welfare (Elder, 2014; Birch, 2017; Brown and Dorey, 2019; Mather, 2019; Ellwood, 2012; although different perspectives can be observed: Browman et al., 2019; Jacquet et al., 2019; Seibel et al., 2020).

Developing marine aquaculture – or mariculture – creates competition with the best places to fish. In some areas, useable marine space has become scarce and spatial conflicts intensify, particularly near populated coastal areas (Hipel et al., 2018; Tuda et al., 2014; Hamilton, 2013; Hovik and Stokke, 2007; Gowing et al., 2006). Traditional activities such as shipping (commercial and naval), fishing, extracting oil, gas, and minerals, and tourism have expanded, and new types of offshore activities have emerged (such as different types of renewable energy, etc.) (Kleingärtner, 2018). At the beginning of the 21st century, even the ocean's remotest spaces have become subject to exploitation (Koschinsky et al., 2018; Markus, 2018). Hance Smith has aptly coined this overall development as the “industrialization of the world ocean” (Smith, 2000) and others have referred to it as the “blue acceleration” (Jouffray et al., 2020).

The struggle for access to or use of marine waters has had a negative impact on the development of aquaculture. Conflicts between aquaculture projects, fisheries, and tourism have been reported and analysed (Bergh et al., 2023; Bienstman et al., 2020; Dempster and Sanchez-Jerez, 2008). Conflicts with nature conservation are also common (GESAMP, 2008). Aquaculture has also been adversely affected by agriculture and wastewater discharges (Diaz et al., 2012; Gowing et al., 2006). These developments limit the space available for aquaculture, especially as marine aquaculture requires areas with specific environmental and water quality characteristics. Often the lack of suitable space has been a barrier to expansion (Sanchez-Jerez et al., 2016).

Not least in response to increasing competition and conflict over marine space, aquaculture operations have moved further from the coast and often into more energetic environments, i.e. areas exposed to more wind, stronger tidal currents, and higher waves (Buck et al., 2024; Hipel et al., 2018). This development has created a need for terms and concepts that allow those involved in the siting of aquaculture operations to define sites in more than just vague terms of distance from shore (Buck et al., 2024). In particular, terms such as “offshore” or “open ocean” should be replaced by more robust concepts that refer to aspects of a site such as the geographical distance from shore or infrastructure, the degree of exposure to large waves and strong currents, the geographical fetch, the water depth, or a combination of these parameters (Buck et al., 2024). Increasing conceptual clarity can promote a common understanding and better identification of marine site characteristics and allow comparison and evaluation of sites for development (Heasman et al., 2024).

The purpose of this article is to review the existing Law of the Sea in general, and aquaculture law in particular, in order to assess what concepts and rules currently govern the siting of aquaculture operations. In particular, the role of the term “offshore” in the law of the sea will be assessed to see if there are any legal aspects that need to be considered in moving towards the use of more specific concepts. It also aims to inform scientific discussions and political and administrative processes on the law governing the

identification, description and siting of aquaculture operations. This will hopefully contribute to sustainable and less conflictual aquaculture development in the long term.

This manuscript is part of a suite of papers comprising a special edition “Differentiating and defining “exposed” and “offshore” aquaculture and applications for aquaculture operation, management, costs, and policy”. The special edition includes manuscripts focused on aquaculture policy and regulation in marine environments, the definitions of terms regarding aquaculture in marine systems, the derivation of the energy indices, trends required to advance aquaculture into high energy marine zones, costs and implications in aquaculture of using the indices and social science aspects relating to marine aquaculture (Buck et al., 2024; Sclodnick et al., in press).

The article is structured as follows: first, it describes some of the basic socio-economic impacts of aquaculture siting (Section 2). Second, it outlines the existing legal framework within which marine aquaculture activities take place in three sub-sections, international law relating to maritime zones, responsibilities and requirements for aquaculture projects, and the siting of aquaculture projects (Sections 3.1–3.3 respectively). Thirdly, it will assess how the basic geographical concept of “offshore” is used in the Law of the Sea and illustrate its limited use in locating areas suitable for aquaculture (Section 4). The paper concludes with a summary and discussion of the scientific and policy need for greater conceptual clarity and its use to better implement international and national legal requirements to promote responsible and sustainable siting (Section 5).

2 Social-economic effects of siting aquaculture operations

Aquaculture operations exclusively occupy ocean areas that were formerly freely accessible and where resources were shared (Bankes et al., 2016b, p. 7). Where governments support and strengthen operators' claims to these spaces, they turn into something economists would call economic institutions and lawyers would refer to as use or property rights (Munzer, 1990; Penner, 1997). Foreclosing other users from specific areas or resources, however, clearly has distributional implications (Markus and Markus, 2021; Posner and Sykes, 2010; Hallwood, 2014). At a fundamental level, aquaculture operations reduce the overall ocean space available to others. Other aquaculture operators are excluded and will have to move their activities to places where farming might be more expensive. Production costs may be higher because ocean spaces are further away from shores, not directly connected to harbors and markets, have lower water quality, or because they are more exposed to strong winds, waves, tides, and currents, etc (Buck et al., 2024). Potential users from other sectors are also excluded from using these areas. They may, for example, have to evade, reroute, or relocate their shipping, fishing, mining, or energy production activities. In addition to foreclosing access by others to aquaculture sites, operations may also generate costs for economic actors elsewhere. Facilities may, for example, lower the touristic value of coastal areas in close proximity to the farms, both

due to spoiled views and (possible) negative impacts on the marine environment.

3 Legal frameworks for siting aquaculture operations

The following section outlines international and national policies and laws that order human activities in marine spaces in which aquaculture takes place. This includes policies and laws that direct and guide those who are actively involved in siting aquaculture projects. The first subsection outlines binding rules of international law that establish a zonal framework in which coastal states can develop their own spatial orders for aquaculture. The second subsection provides an overview of policies and laws that states should consider when ordering marine spaces and selecting specific sites, e.g. environmental responsibilities. The third subsection highlights policies specifically designed to guide the process of siting aquaculture projects.

3.1 Zones in international law and coastal states' spatial orders

The starting point of all law on sea-related investigations is the United Nations Convention on the Law of the Sea (UNCLOS) from 1982. It contains 320 articles and nine annexes and seeks to provide a global and comprehensive framework regime for the oceans. Its preamble explicitly acknowledges that the “problems of ocean space are closely interrelated and need to be considered as a whole”. UNCLOS is often referred to as the “constitution for the oceans”. Especially relevant for the purposes of this article, UNCLOS divides the seas into different zones and allocates the coastal states' sovereign powers, rights, and duties. With a view to aquaculture production, four zones are of importance. UNCLOS distinguishes between inland waters, territorial waters, exclusive economic zones (EEZ), and the high seas (the so called “archipelagic waters” are a special case, applying only to archipelagic states as defined in Art. 46 and Art. 47 UNCLOS). All zones extend from the baseline, i.e. the starting point for delimiting a coastal state's maritime zones. From this point onwards, the areas in question encompass inland waters, extending landwards, territorial waters up to 12 nautical miles seawards, and the Exclusive Economic Zone (EEZ) from the outer limit of the territorial waters to 200 nautical miles from the baseline. Whereas in principle, the sovereignty of the coastal states extends to inland and territorial waters, they only have functionally limited sovereign rights for the purpose of exploring and exploiting, conserving, and managing the natural resources in the EEZs (Art. 56 UNCLOS). The high seas stretch beyond the EEZ and the continental shelf (Art. 86 et seq. UNCLOS). Here the “freedoms of the high seas” apply (freedoms of shipping, overflight, laying submarine cables and pipes, installing systems, fishing, scientific research, etc.) which entitle all states to develop aquaculture projects.

Within the limits of rights granted under UNCLOS, coastal states are free to govern these zones. Most importantly, this means

that coastal states can permit and regulate economic activities such as fishing, mining, energy generation, or – the case in point – aquaculture. They can thus also establish a marine spatial order in the sense that they may allow or ban such activities in certain areas. A spatial order is systematically developed by the responsible authorities and institutions of each coastal state. In federal states, such as Germany or the United States, authorities can be part of the federation or the federal states. Occasionally the division of powers between the different governmental levels and institutions can be quite complex and result in confusing governance structures regarding different maritime activities. In Germany, for example, the Constitution assigns powers to regulate offshore mining in territorial waters and the EEZ to the central government, but it is the federal states who run the administrative procedures and grant or deny permissions. With regards to offshore-wind-farming, the central government regulates only activities in the EEZ, federal states have the right to do so up to 12 nm (but less if the central government would decide so). Commercial fishing activities, however, are exclusively regulated at the EU-level. It is the central government who implements these rules (particularly quotas and technical measures).

3.2 Laws and policies laying down substantive requirements for aquaculture projects

International and national law also sets out substantial requirements that states have to consider while shaping their respective marine spatial order. For example, legal requirements exist regarding environmental conservation, navigation, and health protection.

There is no binding international treaty specifically designed to govern aquaculture activities. David L. VanderZwaag has aptly summarized the overall status of international aquaculture law when he writes of a “complex mix of international agreements, documents and initiatives (that) has emerged to promote sustainable aquaculture (...)” (VanderZwaag, 2016). Binding treaties such as UNCLOS, the Convention on Biological Diversity (CBD), or the Convention on Wetlands of International Importance (RAMSAR-Convention) establish rather general environmental conservation requirements. States are obligated, for example, to take measures protecting specific areas (e.g. wetlands) or specific species (e.g. migratory birds and cetaceans), to reduce pollution, to establish and implement environmental impact assessment procedures for potentially harmful activities (EIA), or to prevent the introduction of alien species, etc (VanderZwaag, 2016).

Many of these general obligations are further spelled out in international non-binding instruments, some of which specifically address marine aquaculture (VanderZwaag, 2016). Most importantly in this regard is the FAO Code of Conduct for Responsible Fisheries. While the Code mainly addresses marine capture fisheries, its general principles and one provision apply to marine aquaculture. In general, the Code demands the application

of the precautionary approach and calls on states to promote public participation of fish farmers in policy formulation and implementation (see Art. 6 of the FAO Code of Conduct). More specifically, Art. 9 calls on states, *inter alia*, to develop an appropriate legal and administrative framework for aquaculture, to produce and regularly update aquaculture development strategies and plans, to establish an EIA-system specifically for aquaculture, and to cooperate with neighboring countries in aquaculture development. These general responsibilities are further elaborated in eight non-binding technical guidelines, on Aquaculture Development (1997), on Good Aquaculture Feed Manufacturing Practice (2001), on Health Management for Responsible Movement of Live Aquatic Animals (2007), on Genetic Resource Management (2008), on Ecosystem Approach to Aquaculture (2010), on the Use of Wild Fish as Feed in Aquaculture (2011), on the Use of Wild Fishery Resources for Capture-based Aquaculture (2011), and on Aquaculture Certification (2011). Many other technical reports have also been published, including one addressing aquaculture governance, titled “Policy and Governance in Aquaculture: Lessons Learned and Ways Forward” (2014) (VanderZwaag, 2016).

Within and often encouraged by this international legal framework, coastal states adopt their own policies and laws that govern aquaculture activities carried out by their nations or within waters under their sovereignty or jurisdiction (inland and territorial waters, and their EEZ). Most countries who have an aquaculture sector of a certain size have developed sets of rules (overview provided at FAO, 2024b and for academic discussions see Bankes et al., 2016a; VanderZwaag and Chao, 2006; for Chile see Wack, 2013). These often include national aquaculture strategies, permit and licensing systems, specific environmental conservation obligations (e.g. the obligation to carry out an EIA), differing (spatial) planning, reporting, monitoring, control, and enforcement requirements, as well as regulations regarding taxation or public funding (Howarth, 2006). Only a few countries, however, have adopted a stand-alone aquaculture code, specifically and comprehensively addressing aquaculture (e.g. South Australia). Most states rely on different sets of rather uncoordinated, sometimes contradictory provisions included in fisheries, land use, spatial planning, and environmental conservation codes (Bankes et al., 2016a, c).

3.3 Laws and policies directing the siting of aquaculture projects

Generally, different countries have adopted strategic approaches to structuring the location of ocean activities through some form of marine spatial planning (MSP). MSP has been broadly defined as “a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that have been specified through a political process” (Ehler and Douvere, 2009; Maes, 2008). In many countries MSP has become a key tool for managing the conflicts resulting from the increasing utilization and industrialization of the world’s seas and oceans (Schubert, 2018, pp. 465–466; Tuda et al., 2014; Carneiro, 2013; Jay et al., 2013).

Recognizing aquaculture’s spatial needs in this strategic planning process is key to ensuring that aquaculture projects are directed to suitable places. This has been acknowledged in some of the abovementioned instruments. For example, the FAO Code of Conduct calls on states to adopt integrated coastal area management frameworks to assist in determining access right and avoiding conflicts (Art. 10). Where aquaculture activities could potentially affect transboundary aquatic ecosystems, it encourages states to cooperate to ensure “responsible choices of species, siting, and management” (Art. 9.2.2.). The FAO Technical Guidelines for Responsible Fisheries No. 5: Aquaculture Development more specifically require that “governments should ensure that aquafarms are sited and managed such that adverse effects on environments and resources of other States are avoided.” (FAO, 1997, p. 17). In particular, the newly adopted FAO Guidelines for Sustainable Aquaculture of July 2024 highlight the importance of appropriate marine spatial planning tools for site selection. According to the Guidelines “spatial selection must be carried out in a responsible manner in line with international instruments and agreed good practice.” To this end States should adopt a “clear, transparent, equitable and inclusive process to designate suitable areas for aquaculture and sites within each area.” The process should be, *inter alia*, be based on the best available knowledge, involve identifying and including relevant stakeholders, evaluate the potential environmental, social and economic impacts, as well as potential synergies and conflicts with other activities or protected areas. Special attention should be paid to small-scale sector (FAO, 2024c, paras. 4.2.3, 4.2.4).

Aquaculture thus needs to be considered in the process of MSP, both when specifying the economic objectives that should be achieved by the spatial plans as well as in the process of developing the plan itself. Some countries have adopted national marine spatial plans, some of which acknowledge the importance of aquaculture, and some countries have adopted specific spatial plans solely for aquaculture (Bankes et al., 2016a; Schubert, 2018, pp. 465–466).

Ideally the process of integrating aquaculture into marine spatial planning entails four main steps (which could be broken down into further smaller steps): 1) national or subnational scoping, 2) zoning, 3) site selection, and 4) area management (see Table 1).

The zoning and siting steps include assessments concerning areas’ general and sites’ specific suitability for aquaculture. Assessments at both stages rely to varying degrees on a complex set of biophysical, environmental, social, and economic, as well as regulatory information and criteria.

4 Ambiguity of geographical terms in the law of the sea

Actors involved in aquaculture often operate with spatial concepts such as “inshore”, “foreshore”, “offshore”, or “open ocean”. Such concepts have been used to characterize different types of aquaculture, referring to farms’ location in relation to the shoreline. But moving operations further seawards has revealed that such concepts are neither very precise, nor do they provide clear information about the site’s environmental, economic, and social

TABLE 1 Scoping, zoning, site selection, and area management for aquaculture.

Steps	Process
National/subnational scoping	<ul style="list-style-type: none"> Review of national/subnational priorities for aquaculture Identification of relevant stakeholders Review and possible adaptation of laws, policies, institutional framework affecting aquaculture Identification of general issues and opportunities Identification of potential for cultured species and farming systems
Zoning	<ul style="list-style-type: none"> Identification of areas suitable for aquaculture Identification of issues and risks in zoning Estimation of broad carrying capacity Legal designation of zones for aquaculture
Site selection	<ul style="list-style-type: none"> Assessment of suitability for aquaculture Detailed estimation of carrying capacity for sites Biosecurity planning and disease control Authorization arrangements
Forming management areas	<ul style="list-style-type: none"> Grouping of farms into management areas (delineation with stakeholder consultation) Establishing an area management entity

Source: [FAO/World Bank \(2017\)](#).

conditions for aquaculture operations ([Buck et al., 2024](#)). Accordingly, definitions of what such terms actually mean differ among scientists. This particularly holds true with regards to the term “offshore” ([Froehlich et al., 2017](#); [Morro et al., 2021](#)). To illustrate these terms’ ambiguity, the following paragraphs will investigate the meaning and relevance of the term “offshore” from a literal and a legal perspective. While the analysis is not necessarily comprehensive, it illustrates that there is neither a common understanding nor a uniform practice at the national or international level regarding the use of the term “offshore” within the law of the sea.

The term offshore consists of two elements. In a non-legal, spatial, or geographical context, the word “off” usually indicates a certain degree of separation between different entities (“away from”, “removed from”, “separated”, “not at” etc.) (see, for example, [Cambridge Dictionary, 2024](#)). The term “shore”, on the other hand, is most commonly used to describe an area of land that stretches along the edge of a body of water. Merely joining together such relatively straightforward terms, however, does not allow for an objective definition of a specific area at sea. Based on a literal interpretation alone, the exact location, i.e. the geographical line where the shore begins and ends, as well as the distance between that line and a chosen geographical point at sea, lying “off” the “shore”, remains open to interpretation.

Despite its vagueness, the term offshore (sometimes “foreshore”) has globally appeared in many different national laws governing a variety of maritime activities such as fisheries, shipping, or oil extraction. Its meaning under these rules, however, has not been consistent over the years. The term has been used to describe both areas within close proximity to states’ coasts and areas lying further out in the sea.

Several national laws have used the term in connection with regulations which have been applicable outside their territorial waters or even further out in the sea. Notably, until the late

1970s, many coastal states claimed territorial waters only up to three nautical miles ([Noyes, 2015](#)). For example, the Philippines Fisheries Act from 1932 ruled that boats larger than 3 tonnes gross were eligible for an *off-shore fishing license* but banned them from fishing within three nautical miles from the shore line (Sec. 18 and Sec. 21 Philippines Fisheries Act No. 4003: [UN, 1957](#), p. 559). According to the Malayan Petroleum Mining Act of 1966 “*off-shore land* means the area of the continental shelf” which, in turn, is defined as the “sea-bed and subsoil of those submarine areas (...) beyond the limits of the territorial water” (Malaysian Petroleum Mining Act, 1966: [UN, 1970](#), pp. 375, 378). The famous American unilateral Truman Proclamation from 28 September, 1945, referred to the term *offshore* in order to point out that oil deposits of interest to the U.S. lie in areas beyond the traditional three nautical mile limit of national jurisdiction.¹ The Cuban General Fisheries Statute from 1936 demanded that the masters of fisheries vessels only discharged certain waste materials “into the sea *off-shore* at a distance of not less than five nautical miles from the coast” (Art. 46 General Law on Fisheries, 1936: [UN, 1951](#), p. 65). Specifically with a view to aquaculture, the National Offshore Aquaculture Act of 2005 in the U.S. provides that the term “offshore aquaculture” means “all activities, including the operation of offshore aquaculture facilities, involved in the propagation and rearing, or attempted propagation and rearing, of marine species in the United States Exclusive Economic Zone” (i.e. in an area lying beyond territorial waters) (Sec. 3 No. 6 National Offshore Aquaculture Act 2005).

In contrast, other national laws governing maritime activities have used the term offshore to regulate activities closer to shore. For example, the US Federal Water Pollution Control Act of 1948 as amended in 1970 defined “offshore facility” to mean “any facility of any kind located in, on, or under, any of the navigable waters of the United States other than a vessel or a public vessel” (Sec. 10 of the US Federal Water Pollution Control Act, Public Law 91-224, 1970). The UK’s Mineral Workings (Offshore Installation) Act from 1971 had as its territorial scope the “waters in or adjacent to the United Kingdom up to the seaward limits of territorial waters, and the waters in any designated area within the meaning of the Continental Shelf Act 1964” (Sec. 1, Sec. 8 Mineral Workings (Offshore Installation) Act from 1971: [UN, 1974](#), p. 107). The Singapore Liability (Oil Pollution) Act of 1973 defined an offshore facility as “any facility of any kind located in, on or under many of the territorial waters of Singapore other than a ship” (Singapore Civil

1 “Petroleum geologists believe that portions of the continental shelf beyond the three-mile limit contain valuable oil deposits. The study of subsurface structures associated with oil deposits which have been discovered along the Gulf coast of Texas, for instance, indicates that corresponding deposits may underlie the offshore or submerged land. The trend of oil-productive salt domes extends directly into the Gulf of Mexico off the Texas coast. Oil is also being taken at present from wells within the three-mile limit off the coast of California. It is quite possible, geologists say, that the oil deposits extend beyond the traditional limit of national jurisdiction.” Presidential Proclamation No. 2267: [UN, 1951](#), p. 39.

Liability (Oil Pollution) Act, 1973). Finally, the Thailand Petroleum Act of 1971 provided that an “offshore exploration block” includes “the areas of those islands located therein (...)” (Sec. 28 Thailand Petroleum Act of 1971: [UN, 1948](#), p. 102).

UNCLOS uses the term “offshore” seven times in total², referring one time to “offshore installations” and six times to “offshore terminals” (See Arts. 11, 211 (3), 216 (1) lit. c., 218 (1), (3), 219, and 220 (1) UNLCOS). Art. 11 UNCLOS mentions “offshore installations” and deals with the role of ports in delimiting coastal states’ territorial waters. It provides that for this purpose “(...) the outermost permanent harbor works which form an integral part of the harbor system are regarded as forming a part of the coast. Off-shore installations and artificial islands shall not be considered as permanent harbor works.” In essence, Art. 11 UNLCOS regulates what is not an integral part of the harbor system. It aims to prevent coastal states from excessively pushing further into the sea – through building offshore structures – the points from which they can draw their baselines, i.e. the lines from which the outer limits of a state’s maritime zones are measured (territorial sea, contiguous zone, exclusive economic zone (EEZ), and, to some extent, continental shelf). To not form such an integral part, structures need to be physically separated from the harbor system, that is, they must be located at a certain distance away from the harbor structures, which are themselves connected to the coastal landmass (on State practice see [Symmons, 2017](#)).

All other UNCLOS provisions using the term “offshore” are included in Part XII on the protection and preservation of the marine environment and specifically refer to “offshore terminals”, i.e. Arts. 211 (3), 216 (1) lit. c., 218 (1), (3), 219, and 220 (1) UNLCOS. All of these provisions aim to ensure that the different UNCLOS provisions regarding the prevention of pollution by ships will be applied equally to coastal states’ territories, ports, and offshore terminals. Offshore terminals have been defined as “artificial islands or installations outside the internal waters, which serve as port facilities for loading and offloading mainly oil and gas (...)” ([König, 2017](#)). There are, again, no exact criteria or methods to define the exact distance between territories, ports, and offshore terminals.

The most elaborate and systematic approach to defining the term “offshore” in an international treaty has been adopted within the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention) of 1992. The definitions, however, mainly focus on describing certain activities, rather than defining the exact location where they will be carried out. The Convention defines “offshore activities” as “activities carried out in the maritime area for the purposes of the exploration, appraisal or exploitation of liquid and gaseous hydrocarbons” (Art. 1 j), OSPAR-Convention). In addition, an “offshore installation” means “any man-made structure, plant or

vessel or parts thereof, whether floating or fixed to the seabed, placed within the maritime area for the purpose of offshore activities” (Art. 1 l), OSPAR-Convention). It also defines “offshore pipelines” as “any pipeline which has been placed in the maritime area for the purpose of offshore activities” (Art. 1 m), OSPAR-Convention). An “offshore source” includes “offshore installations and offshore pipelines from which substances or energy reach the maritime area” (Art. 1 k), OSPAR-Convention). All of these definitions refer to the “maritime area”, which according to the geographical scope laid out by the OSPAR Convention, entails parties’ territorial waters, their exclusive economic zones, as well as the high sea areas governed by the OSPAR-Convention.³

In essence, the term offshore only has two general implications: first, it points to a geographical spot not located on land, and second, this spot is to some extent physically detached from or not integrated into the shoreline (however that may be defined). It does not designate specific geographical points, lines, areas, or spaces, nor a certain distance. The term’s vagueness is reflected in its inconsistent use within both national and international law of the sea. States have used it variably to describe locations either distant or close to their shores, sometimes lying inside and sometimes outside their territorial waters. Accordingly, where lawmakers need to define specific areas at sea more clearly, they are required to apply additional, more objective and more specific criteria or methods.

5 Discussion

The struggle for access to or use of marine waters can slow the development of aquaculture. Not least in response to increasing competition and conflict over marine space, aquaculture operations have moved further from the coast. This development has led to calls for clearer terms and concepts to enable those involved in aquaculture to describe and define sites with increasing precision. Greater conceptual clarity can support a better understanding and identification of marine site characteristics and allow comparison and evaluation of sites for development. At best, this will reduce conflicts and improve the economic and environmental outcomes of aquaculture operations.

The Law of the Sea does not prevent the development and application of such clearer concepts. In essence, it establishes a spatial order by defining maritime zones and assigning rights and obligations to States in these areas. Within these rights and obligations, coastal states are free to permit and regulate aquaculture. They can also establish their own marine spatial order in the sense that they can allow or prohibit activities in certain areas, including aquaculture. International and national laws also impose specific requirements on aquaculture operations,

² It only uses the term “shore” one more time in Art. 10 (3) on Bays. It uses the term “coasts” which has been defined in the UN Glossary as “the sea shore. The narrow strip of land in immediate contact with any body of water, including the area between high- and low-water lines” ([UN Office for Ocean Affairs and the Law of the Sea, 1989](#), p. 52).

³ “Maritime area” means the internal waters and the territorial seas of the Contracting Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal state to the extent recognized by international law, and the high seas, including the bed of all those waters and its sub-soil, situated within the following limits (...), see Art. 1, OSPAR Convention.

including obligations to protect the environment, navigation and public health.

In general, various countries have adopted strategic approaches to structuring the location of marine activities through some form of marine spatial planning (MSP). Recognizing the spatial needs of aquaculture in this strategic planning process is key to ensuring suitable space for aquaculture. Ideally, the integration of aquaculture into marine spatial planning will involve a process of scoping, zoning, site selection, and area management. This is where approaches to defining aquaculture sites become relevant. As projects move further out to sea, the diversity of possible conditions increases and clearer concepts for scoping, zoning, site selection, and management are required.

For a long time, the term “offshore” was used interchangeably to refer to aquaculture sites further away from the coast. The literal and legal analysis of the term “offshore” has shown that rather vague geographical concepts alone cannot help to identify, assess and locate suitable aquaculture areas or projects. The growing diversity of possible aquaculture sites requires more clear and robust concepts to include aspects of a site such as the exact geographical distance from shore or infrastructure, the degree of exposure to large waves and strong currents, the geographical fetch, the water depth, or a combination of these parameters.

While various international treaties and national laws use the generic term “offshore” and other vague geographical terms to describe sites at sea, this does not prevent the development of clearer concepts to define aquaculture sites. In fact, the opposite is true.

It can be argued that the international obligations outlined above to take measures to protect specific areas and species, to reduce pollution, to prepare and implement EIAs, or to prevent the introduction of alien species, etc., require and call for the development of clearer approaches. In particular, the non-binding FAO Code of Conduct calls on states to adopt integrated coastal zone management systems and to cooperate with each other to ensure, among other things, “responsible siting” (where aquaculture projects may have transboundary impacts). In addition, the “Guidelines for Aquaculture Development” more specifically encourage “sustainable siting” meaning that “aquaculture production should be economically and socially appropriate, raise minimal conflicts with other users, and respect nature reserves, protected areas and sensitive habitats”. There is also widespread agreement in the scientific community that a systematic process of scoping, zoning, site selection, and site management is required to implement all these requirements. All this argues for the development of approaches to define aquaculture sites. Only if aquaculture sites can be adequately described can marine spatial planning, including zoning and site selection, be adequately informed and help to secure suitable aquaculture sites and allow aquaculture development.

The above analysis also shows that the overall suitability of marine areas for aquaculture production depends on a number of other factors. Accordingly, assessing the characteristics of projects and sites requires a multi-dimensional descriptor-based assessment, reflecting the scientific, technical, economic, legal, and social characteristics of larger marine areas and of specific sites (see also [Taylor and Kluger, 2018](#)). A multi-dimensional set of assessment criteria for areas’ and specific sites’ suitability for aquaculture will have to be developed in the future. This paper has highlighted three general trends that may need to be considered as aquaculture moves further away from the coast. First, the number of conditions to be considered increases as the diversity of conditions for aquaculture operations increases. Second, facilities’ exposure to higher energy levels in addition to longer distances from harbors and possibly markets is likely to make marine aquaculture more costly and risky. Third, while use interests from other individual users may decrease the farther operations move seawards, other countries’ interests and legal rights will increase and have to be considered in the process of planning and site selection (e.g. other countries’ rights in the EEZ with a view to navigation).

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